Daniel S. Johnson

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Education

Stanford University, *Stanford, CA* *June 2023*
PhD: Computer Science, Stanford Graduate Fellow
MS: Computer Science

University of Illinois at Urbana-Champaign, *Urbana-Champaign, IL* *May 2018*
Bachelor of Science: Computer Science, with Highest Honors ***GPA: 3.93/4.00***
Bachelor of Science: Physics, with Highest Honors
Minor: Mathematics

Experience

InstaDeep/BioNTech, *San Francisco, CA* *July 2023 - Present*
Research Engineer
- Collaborating with clients (including a large insurance corporation) to transition to data-driven decision-making utilizing ML/DL

Meta, *Menlo Park, CA* *June 2022 - September 2022*
Software Engineer Intern - AutoML
- Developed multi-stage inference algorithm that handling 50% of data on a simple ML model (LRwBins) embedded in product code
- Implemented algorithm in production environment
- Implemented robust tests showing a 1.3x latency speedup and 30% reduction of CPU resource usage
- This is a major improvement for a production environment making millions of inferences per second
- Published paper at AutoML 2023 (video link)

Stanford Artificial Intelligence Laboratory | Fedkiw Lab, *Stanford, CA* *September 2018 - June 2023*
PhD Student
- Wrote thesis on smoothing discontinuous physical phenomena for differentiability in learning
- Construct mathematical framework behind combination eulerian/lagrangian fluids optimization project
- Contribute to physics postprocess to machine learning paper
- Write CUDA code to speed up physics postprocess
- Passed all 6 PhD qualifying exams for the ICME Program
- Deep Learning (CS230), Math in ML (CS205L), Graphics (CS148) Course Assistant

Nvidia, *Santa Clara, CA* *December 2021 - June 2022*
Software Engineer - Omniverse (Part time)
- Developed GauGAN plugin for Nvidia Omniverse
- Worked toward temporally consistent vid2vid using semantically segmented 3D objects and scene generated point clouds as input

Nvidia, *Santa Clara, CA* *June 2021 - September 2021*
Software Intern - Robotics AI
- Improve physics simulation of ultrasonic waves (BRDF and specular bouncing)
- Train and improve parking obstacle avoidance network (ultrasonic data to evidence grid map)
- Integrate parking planner into physics simulation (Isaac Sim)

Intel, *Santa Clara, CA* *June 2020 - September 2020*
Deep Learning and GPU Intern
- Developed analytical multi-frame super-resolution algorithm
- Investigated algorithm pipeline in the context of deep learning

National Center for Supercomputing Applications (NCSA) | LIGO Project, *Urbana, IL* *February 2017 - July 2018*
Computational Physics Intern
- Developed critical waveform extraction software called the **P**ython **O**pen Source **W**aveform **E**xtracto**R** (POWER)
- Presented POWER at Einstein Toolkit Conference
- Write paper as first author on POWER
- Member of Laser Interferometer Gravitational-Wave Observatory (LIGO) Scientific Collaboration
- Run unique simulations on Blue Waters supercomputer to be used by LIGO in gravitational wave astronomy
- Recognized as Outstanding Intern by Director of NCSA
- Reappointed as academic year intern

Hybrid Illinois Device for Research and Applications (HIDRA) Fusion Reactor, *Urbana, IL* *January 2015 - June 2018*
Senior Undergraduate Research Student
- Design and build HIDRA control system in LabVIEW
- Write paper as first author on HIDRA control system
- Improve the efficiency of group communication
- Prepared HIDRA for experimentation
- Design and construct eight safety structures around HIDRA
- Reconstruct and calibrate microwave magnetron for undergraduate research symposium poster session
- Author on preliminary results initial HIDRA paper

Garmin | Aviation Department, *Olathe, KS* *May 2016 - August 2016*
Software Engineer Intern
- Designed and wrote module tests for XHTML Engine used in various hardware systems
- Worked on database management within Garmin display unit
- Modified configuration management and cyclic redundancy checking (CRC) on display unit and touchscreen controller
- Learned about and mastered multiple real world software development tools such as version controlling

Wolfram Research, *Champaign, IL* *September 2014 - February 2015*
Software Engineer Intern
- Created and integrated tests for Mathematica box functions
- Provided constructive comments on performance, optimization, and development of Wolfram Cloud

Publications

Papers

1. **D. Johnson**, I. L. Markov, "Efficient Multi-stage Inference on Tabular Data." AutoML, Sep. 2023.
2. **D. Johnson**, "Addressing Discontinuous Root-Finding for Subsequent Differentiability in Machine Learning, Inverse Problems, and Control." Stanford University PhD Thesis, June 2023.
3. **D. Johnson**, R. Fedkiw, "Addressing Discontinuous Root-Finding for Subsequent Differentiability in Machine Learning, Inverse Problems, and Control." Preprint, May 2023.
4. **D. Johnson** et al., "Software-based Automatic Differentiation is Flawed." Preprint, May 2023.
5. Z. Geng, **D. Johnson**, R. Fedkiw, "Coercing Machine Learning to Output Physically Accurate Results." Journal of Computational Physics, Nov. 2019, https://doi.org/10.1016/j.jcp.2019.109099.
6. **D. Johnson**, E. A. Huerta, R. Hass, "Python Open Source Waveform Extractor (POWER): An open source, Python package to monitor and post-process numerical relativity simulations." Classical and Quantum Gravity, Nov. 2017, https://doi.org/10.1088/1361-6382/aa9cad.
7. **D. Johnson**, K. Wegley, R. Rizkallah, A. Shone, D. Andruczyk, "HIDRA Control System (HCS): An open source, LabVIEW-based program to control the Hybrid Illinois Device for Research and Applications." Fusion Engineering and Design, Feb. 2017, https://doi.org/10.1016/j.fusengdes.2018.02.016.
8. A. Rebei, E. A. Huerta, S. Wang, S. Habib, R. Haas, **D. Johnson**, D. George, "Fusing numerical relativity and deep learning to detect higher-order multipole waveforms from eccentric binary black hole mergers." Physical Review D, June 2019, https://doi.org/10.1103/PhysRevD.100.044025.
9. E. A. Huerta, R. Haas, S. Habib, A. Gupta, A. Rebei, V. Chavva, **D. Johnson**, S. Rosofsky, E. Wessel, B. Agarwal, D. Luo, W. Ren, "Physics of eccentric binary black hole mergers: A numerical relativity perspective." Preprint, Sep. 2019, https://arxiv.org/pdf/1901.07038.pdf.
10. E. A. Huerta, C. J. Moore, P. Kumar, D. George, A. Chua, R. Haas, E. Wessel, A. M. Holgado, **D. Johnson**, D. Glennon, A. Rebei, J. R. Gair, and H. P. Pfeiffer, "ENIGMA: Eccentric, on-spinning, Inspiral Gaussian-process Merger Approximant for the characterization of eccentric binary black hole mergers." Physical Review D, Jan. 2018, https://doi.org/10.1103/PhysRevD.97.024031.
11. R. Rizkallah, D. Andruczyk, A. Shone, **D. Johnson**, Z. Jeckell, S. Marcinko, Z. Song, D. Curreli, F. Bedoya, A. Kapat, J. P. Allain, M. Christenson, M. Szott, S. Stemmley, H. Sandefur, D. N. Ruzic, R. Maingi, J. Hu, G. Zuo, J. Schmitt, "Latest Results from the Hybrid Illinois Device for Research and Applications (HIDRA)." IEEE Transactions on Plasma Science, June 2018, https://doi.org/10.1109/TPS.2018.2838571.
12. Additional LIGO papers with little/no contribution

Conference Presentations

1. **D. Johnson**, E. A. Huerta, R. Hass, "Python Open Source Waveform ExtractoR (POWER): An open source, python package to post-process numerical relativity simulations." Paper presented at the 2017 North American Einstein Toolkit School and Workshop at NCSA, Aug. 2017.
2. D. Andruczyk, Z. Song, N. Chopra, **D. Johnson**, A. Shone, D. Ruzic, J. P. Allain, D. Curreli, HIDRA Team, "First Results and Future Plans on HIDRA," in APS Meeting Abstracts, Oct. 2016.
3. R. Rizkallah, D. Andruczyk, Z. Jeckell, A. Shone, **D. Johnson**, J. P. Allain, D. Curreli, D. Ruzic, The HIDRA Team, "Latest results and developments from the Hybrid Illinois Device for Research and Applications," in APS Meeting Abstracts, Oct. 2017.
4. C. Grattoni, R. Andrews, **D. Johnson**, K. Krout, M. Nicholson, R. Rajan, B. Xie, "Wolfram Demonstrations: A Capstone Project for High School Students." Presentation in the Wolfram Technology Conference 2016, Champaign IL, Oct. 2016.

5. D. Andruczyk, R. Rizkallah, S. Marcinko, **D. Johnson**, A. Shone, Z. Jeckell, M. Christenson, M. Szott, S. Stemley, B. Holybee, R. Maingi, J. Hu, G. Zuo, J. P. Allain, D. Curreli, D. Ruzic, "Overview of the Illinois Hybrid Device for Research and Applications (HIDRA) Project." Presentation in the 16th Latin American Workshop on Plasma Physics (LAWPP), Mexico City, Mexico, June 2017.

6. **D. Johnson**, "Modeling Black Hole Mergers." Presentation for the National Center for Supercomputing Applications: Students Pushing Innovation project, July 2017.

Posters

1. **D. Johnson**, "Modeling and Characterizing Black Hole Mergers." Poster session presented at the National Center for Supercomputing Applications: Student Pushing Innovation, Urbana, IL, Aug. 2017.

2. N. Chopra, **D. Johnson**, J. Park, B. Anderson, "Development and Calibration of a Microwave-based Plasma Heating Source for the HIDRA Toroidal Fusion Device." Poster session presented at the Illinois Undergraduate Research Week Symposium, Urbana, IL, April 2016.

Grants and Funding

1. 2017 Blue Waters allocation for UIUC Projects. "Core-Collapse Supernova Simulations", Computer allocation at National Center for Supercomputing Applications. 1,000,000 CPU node-hours. Undergraduate Research Student.

2. 2017 Blue Waters allocation for UIUC Projects. "Numerical Relativity at NCSA", Computer allocation at National Center for Supercomputing Applications. 600,000 CPU node-hours. Undergraduate Research Student.

Interviews and Media

1. "NCSA Intern Receives Highest Honor from Illinois College of Engineering", {Press Release}, http://www.ncsa.illinois.edu/news/story/ncsa_intern_receives_highest_honor_from_illinois_college_of_engineering.

2. "NCSA SPIN Intern Daniel Johnson Published in Classical and Quantum Gravity", {Press Release}, ncsa.illinois.edu/news/story/ncsa_spin_intern_daniel_johnson_published_in_emclassical_and_quantum_gravit.

3. "Students who followed different paths to Illinois CS named Knights of St. Patrick", {Press Release}, cs.illinois.edu/news/students-who-followed-different-paths-illinois-cs-named-knights-st-patrick.

4. "NCSA Group wins original undergrad research award at Engineering Open House", {Press Release}, ncsa.illinois.edu/news/story/ncsa_group_win_original_undergrad_research_award_at_engineering_open_house.

5. "HIDRA Under Control!", {Press Release}, http://cpmi.illinois.edu/2017/08/11/hidra-under-control/.

6. "Students Gain Valuable Experience through Undergraduate Research", {Press Release}, https://npre.illinois.edu/news/students-gain-valuable-experience-through-undergraduate-research.

Honors & Awards

2018 - 2023	**Stanford Graduate Fellow**, Stanford University College of Engineering	*Stanford, CA*
2017 - 2018	**Knight of St. Patrick**, University of Illinois College of Engineering	*Champaign, IL*
2017 - 2018	**Senior 100 Honorary**, University of Illinois	*Champaign, IL*
2017 - 2018	**C.W. Gear Outstanding Undergraduate Student**, UIUC Department of Computer Science	*Champaign, IL*
2016 - 2017	**Crowe Horwath LLP Outstanding Computer Science Student**, University of Illinois Department of Computer Science	*Champaign, IL*
2016 - 2017	**Dunn Systems Scholarship**, University of Illinois Department of Computer Science	*Champaign, IL*
2016 - 2017	**Robert M. Stephens Engineering Scholarship**, University of Illinois College of Engineering	*Champaign, IL*
2016 - 2017	**Illinois Engineering Achievement Scholarship**, University of Illinois College of Engineering	*Champaign, IL*
2017	**Scholarship to attend Basic Aspects of Superconductivity Course in Shanghai**, University of Illinois Department of Physics	*Champaign, IL*
2017	**Einstein Toolkit Conference Speaker**, National Center for Supercomputing Applications	*Champaign, IL*
2016	**Wolfram Technology Conference Speaker and Scholar**, Wolfram Research	*Champaign, IL*
2017	**Tau Beta Pi Outstanding Initiate Award**, University of Illinois	*Champaign, IL*
2017	**Phi Beta Kappa**, University of Illinois	*Champaign, IL*
2014 - 2018	**James Scholar**, University of Illinois College of Engineering	*Champaign, IL*
2014 - 2018	**Dean's List**, University of Illinois College of Engineering	*Champaign, IL*

Leadership Experience

ICME Summer Workshops, ***Stanford, CA*** *August 2019*
Course Assistant

Stanford Splash, ***Stanford, CA*** *November 2018*
Volunteer Teacher
- Prepared curriculum for and instructed high school students about computer science
- Designed fun coding exercise to reinforce material

Volunteer Illini Projects, ***Urbana, IL*** *August 2016 - May 2018*
Treasurer and Executive Board Member, Former Director of Social Empowerment
- Organize hurricane relief efforts in the aftermath of hurricanes Harvey and Irma
- Organize general events to promote betterment of Champaign-Urbana community
- Create unique weekly volunteering events to help homeless and vulnerable community members
- Distribute food at local food pantry

Computer Science Sail, ***Urbana, IL*** *April 2017*
Volunteer Teacher
- Prepared curriculum for and instructed high school students about computer science

Computer Science Academic Appeals Committee, ***Urbana, IL*** *October 2017 - May 2018*
Committee Member
- Mantain academic integrity of computer science department

Illinois Guidance for Physics Students, ***Urbana, IL*** *January 2017 - May 2018*
Core Member
- Prepared computational physics workshop for undergradute and graduate students
- Worked with small groups to introduce beginners to the basic aspects of programming and computational physics

Provost's Undergraduate Student Advisory Board, ***Urbana, IL*** *August 2016 - May 2017*
College of Engineering Board Member
- Express ideas regarding administrative and academic polices in regular board meetings
- Communicate with members of different colleges to enhance experience of future undergraduate students

University of Illinois | Physics Department, ***Urbana, IL*** *January 2016 - May 2018*
Physics Peer Mentor
- Guide seven freshman undergraduate students through their first year at college.

Society of Underrepresented Physics Students, ***Urbana, IL*** *August 2017 - May 2018*
Member
- Create and maintain club website
- Encourage diversity in physics through guest speakers and analysis of campus culture

Engineering Student Alumni Ambassadors, ***Urbana, IL*** *November 2014 - May 2018*
Core Member
- Mentor younger undergraduate students in their engineering experience
- Maintain important relationships with engineering alumni

Engineering Student Admissions Representatives (ESTAR), ***Urbana, IL*** *Summer 2017*
Tour Guide

Illinois Rock Climbing Club, ***Urbana, IL*** *August 2017 - May 2018*
Core Member

Illinois Cross Country and Track Clubs, ***Urbana, IL*** *August 2014 - May 2018*
Core Member

Skills

Programming C/C++, Python, LaTeX, Parallel Computing (CUDA, OpenMP, MPI), WebGL, Linux, Unity, Blender, VR

Relevant Courses Num. Linear Algebra, Num. Optimization, Convex Optimization, Parallel Programming, Discrete Math